

Claims

[c1] What is claimed is:

1. An analog-to-digital converter, comprising:
at least one input pin for receiving an analog input voltage;
a capacitor for storing charge and producing a voltage across the capacitor;
a current source for flowing current through the capacitor for charging the capacitor;
a first switch electrically connected between the current source and the capacitor for controlling flow of current from the current source to the capacitor;
a comparator for outputting a first comparison value when the analog input voltage and the voltage across the capacitor satisfy a predetermined relationship;
a timer for calculating a charging period of time needed for the analog input voltage and the voltage across the capacitor to satisfy the predetermined relationship, wherein the timer starts calculating the charging period of time when the first switch electrically connects the current source to the capacitor for charging the capacitor and stops calculating the charging period of time when the comparator outputs the first comparison value; and

a controller for controlling operation of the first switch, for starting the timer when the first switch electrically connects the current source to the capacitor for charging the capacitor, for stopping the timer when the comparator outputs the first comparison value, and for converting the charging period of time calculated by the timer into a digital output voltage.

[c2] 2.The analog-to-digital converter of claim 1 wherein the predetermined relationship between the analog input voltage and the voltage across the capacitor is satisfied when the analog input voltage is equal to the voltage across the capacitor.

[c3] 3.The analog-to-digital converter of claim 1 further comprising a second switch electrically connected between the capacitor and ground, wherein the second switch electrically connects the capacitor to ground for a predetermined interval of time for discharging the capacitor before the first switch electrically connects the current source to the capacitor for charging the capacitor.

[c4] 4.The analog-to-digital converter of claim 1 wherein the controller comprises a first input port for periodically polling for the presence of the first comparison value outputted from the comparator.

- [c5] 5.The analog-to-digital converter of claim 1 wherein the controller comprises a first input port for receiving an interrupt generated by the first comparison value outputted from the comparator.
- [c6] 6.The analog-to-digital converter of claim 1 wherein the current provided by the current source is a constant current.
- [c7] 7.The analog-to-digital converter of claim 1 wherein a relationship between the voltage across the capacitor and an amount of time that the current source flows current through the capacitor for charging the capacitor is approximately linear.
- [c8] 8.A method of converting an analog voltage into a digital voltage, the method comprising:
providing a capacitor for storing charge and producing a voltage across the capacitor;
flowing a first current through the capacitor for charging the capacitor;
comparing voltages on two inputs of a comparator for determining when the analog input voltage and the voltage across the capacitor satisfy a predetermined relationship;
calculating a charging period of time from when the first

current beings flowing through the capacitor until when the analog input voltage and the voltage across the capacitor satisfy the predetermined relationship; and converting the charging period of time into a digital output voltage.

- [c9] 9.The method of claim 8 wherein the predetermined relationship between the analog input voltage and the voltage across the capacitor is satisfied when the analog input voltage is equal to the voltage across the capacitor.
- [c10] 10.The method of claim 8 further comprising controlling flow of the first current through the capacitor with a first switch.
- [c11] 11.The method of claim 8 further comprising discharging the capacitor before the first current is flowed through the capacitor.
- [c12] 12.The method of claim 8 further comprising periodically comparing the voltage across the capacitor with the analog input voltage to determine if the voltage across the capacitor is approximately equal to the analog input voltage.
- [c13] 13.The method of claim 8 further comprising generating an interrupt when the voltage across the capacitor is approximately equal to the analog input voltage.

[c14] 14.The method of claim 8 wherein the first current is a constant current.

[c15] 15.The method of claim 8 wherein a relationship between the voltage across the capacitor and an amount of time that the first current flows through the capacitor for charging the capacitor is approximately linear.